Deductive content analysis of research on sustainable construction in India: current progress and future directions

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ABSTRACT

The rising construction output in India and its future potential, fuelled by rapid economic growth and socio-economic transitions, has necessitated sustainability integration into lifecycles of construction projects. The imperatives and implications of this integration transcend India's boundaries by influencing the global efforts in mitigating climate change and realizing the sustainable development goals. Yet, there is lack of studies that synthesize and critically evaluate the available literature to provide an overview of the current state of sustainable construction (SC) research in India and provide directions for future research. To this end, a systematic literature review (SLR) has been undertaken here using deductive content analysis. It reveals that the current SC research endeavours are predominantly oriented towards the macro-industry level, the environmental dimension and the internal stakeholders. Additionally, more emphasis has been provided on the final project deliverable compared to the project processes. Overall, this study makes three specific contributions: i) the current thrust areas of SC research in India have been identified while pointing out the imbalance in this academic pursuit; ii) a deductive content analysis framework has been developed that provides a generic template for conducting similar SLRs in the context of other countries; and iii) multiple research gaps have been identified and suggestions to design future studies are proposed based on extant SC literature, especially from similar developing economies. Therefore, despite its Indian focus, this review allows implications for other developing economies set for a similar socio-economic transition and growth in construction output.

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1. Introduction

The construction industry produces the built environment which contributes significantly to the socio-economic growth of nations, improves the quality of human life (Ofori, 2015; Lopes, 2012; Sev, 2009; World Bank, 1984) and provides large scale employment directly (Serpell et al., 2013) and in allied industries that supply raw materials, products, and services for construction projects (Giang and Pheng, 2011).

The construction industry, however, also has negative impacts on environment and society due to its high consumption of natural and man-made resources (like raw materials, energy, water and land), waste generation, damage to natural support systems (like rivers, forest etc), air, water and soil pollution, uneven social cost-benefit distribution and denial of equal rights and opportunities to less privileged and disadvantaged members of society (like labour) (Banihashemi et al., 2017; Ofori, 2015; Valdes-Vasquez and Klotz, 2013; Zuo et al., 2012). To counter these negative impacts, governments, civil society, non-governmental organizations (NGOs) and customers are increasingly demanding integration of sustainable construction (SC) principles — that call for ensuring social equity, economic prosperity and environmental conservation simultaneously, viz. meeting the Triple Bottom Line (TBL) concerns — in construction projects' lifecycles (Gan et al., 2015). SC practices are becoming the norm, especially in the developed countries due to higher level of awareness among the customers. As suggested by Sfakianaki (2019), the 'number of customers that demand sustainable policies in construction processes is increasing. … and large companies and government agents are setting targets for sustainable techniques and management'. But a similar claim cannot be made in the context of developing economies — witnessing construction of a large number of mega-projects and

impacting the climate change narrative with their growth trajectory (Ofori, 2015) — where SC awareness is much lower and it is largely driven by government policies and legislations (Banihashemi et al., 2017; Du Plessis, 2007).

Most of such fast-growing major developing economies (e.g., China and India), witnessing an unprecedented construction growth, are currently grappling with impending resource constraints and 'increasing demand for access to welfare and well-being' (Ghisellini et al., 2018). This necessitates widespread and proactive adoption of SC practices (Mousa, 2015). Due to the differences in socio-economic structure, culture and lesser resources compared to developed countries, a different approach for SC in such countries is required (Banihashemi et al., 2017). For example, while developed countries approach SC from a technology dominated perspective, this is unreasonable for developing economies due to the lack of technical know-how and resources (Baloi, 2003). Consequently, an emerging theme in the SC literature suggests creating a body of knowledge on SC in developing economies through context-specific conceptual and empirical studies (see for e.g., Banihashemi et al., 2017; Du Plessis, 2007; Mousa, 2015; Ofori, 2015). In-line with this argument, the extant literature reveals many broad-based reviews and empirical investigations that present the current status and practices of SC in large developing economies like: China (Gan et al., 2015; Zhang et al., 2015); Malaysia (Bohari et al., 2017; Zainul Abidin, 2010), Africa (Du Plessis, 2005; Ogungbile and Oke, 2019) and Brazil (Alencar et al., 2017; Giannetti et al., 2018). These studies (see for e.g., Cheng et al., 2015; Liu et al., 2016) highlight the importance of the idiosyncrasy of SC initiatives, rooted in local culture and artefacts for their success. Taken together, these works suggest that while SC in developing countries shares some common operational framework and challenges, its success is contingent on identification of country-specific scenarios.

Yet, a review of extant literature shows a void in the Indian context with no comprehensive review on the current state of SC research. In addition to being one of the fastest growing large economies, India is among the top five economies worldwide. 17 Indian cities are expected to be among the top 20 fastest growing cities globally through 2035 (Oxford Economics, 2018). This growth is manifested as well as driven by construction of a large number of buildings and infrastructure and a similar trend is expected to continue in the next decade as more than half of the projected built environment of 2030 is yet to be constructed (UNFCCC, 2015). The increasing construction output has been accompanied by multiple negative consequences like: (a) increasing pollution, emissions and damage to vital and fragile natural ecosystems (Antony and Nair, 2016; Mani and Reddy, 2012; Mastrucci and Rao, 2018), (b) societal unrest and protests (Diduck et al., 2013), and (c) labour exploitation and large number of occupational accidents (Ray et al., 2015).

The negative consequences have led to the calls for 'decoupling' the industry's growth from its resource intensive and exploitative nature by adopting SC principles (Gokarakonda et al., 2019). Linking this demand to a global outlook, Khosla and Janda (2019, p. 1) suggest that the size and scale, the growth rate and the stage of development 'make India's growth trajectory salient to global climate change outcomes'. Therefore, multiple imperatives for SC in India exist with global implications: a) restricting the global warming to below 2 °C, the goal of Paris agreement, requires India to reduce its GDP's emission intensity, to which construction is a significant contributor (Graham and Rawal, 2019), b) achieving the sustainable development goals (SDGs) through sustainable infrastructure creation (Casier, 2015; Smith, 2015) that benefits one of the largest disadvantaged population group in the world (Wuttke and Vilks, 2014), and c) improving occupational health and safety, and capacity building of millions of unskilled people employed in the Indian construction industry through SC practices and thereby improving the global safety outlook and the societal image of construction industry (Du Plessis, 2002; ILO, 2001, 2009; Ofori, 2015; Wong et al., 2012). Collectively, these works suggest that sustainability is an imminent and important challenge for the Indian construction industry and adopting SC in India has both national and global imperatives.

Based on the foregoing, the authors argue that this paper — presenting a holistic, TBL based overview of the current state of SC research in India along-with the future directions — is not only required but is also timely. Such broad-based reviews provide the industry practitioners with the latest understanding and are also useful for researchers in designing further contextualized empirical studies (Banihashemi et al., 2017; Zainul Abidin, 2010). Accordingly, following two research questions have been finalized for this study:

RQ1. What is the current status of SC research in India with respect to a) publications trends in terms of temporal distributions, main sources, contributing authors and research methods, and b) coverage of the three dimensions (TBL) of sustainability?

RQ2. What are the current thrust areas of research within TBL and which unexplored or underexplored areas — representing literature gaps — exist that require further examination?

This study aims to answer the research questions through a systematic literature review (SLR). Content analysis (CA) is used for this review as per the model suggested by Seuring et al. (2005) for systematic structuring of the literature.

The remaining parts of this paper are organized as follows: Section 2 discusses various dimensions and issues pertaining to SC, which are used subsequently in the review; the methodology is presented in Section 3; the results are outlined in Section 4, and discussed in Section 5 along with the directions for future research. Section 6 presents the conslusions of this study.

2. SC —dimensions and issues

While there are debates in the literature about the key dimensions and issues pertaining to SC (Berardi, 2013), the TBL model, based on social, environmental and economic dimensions is most widely accepted (Berardi, 2013; Goh and Rowlinson, 2015). The same is used here in the CA for enabling 'category identification' and then structuring of the relevant contents in the literature. A brief discussion on these three dimensions and the issues encapsulated in each of them is presented here.

2.1. Social dimension

This dimension relates to the impact of business on various stakeholders who are directly or indirectly affected by it (Liu et al., 2016). While there is a lack of agreement on indicators of social dimension of SC (Zuo et al., 2012), it is mostly understood in terms of welfare of the labour force, the project affected community and the end users associated with constructed projects (Bamgbade et al., 2017; Valdes-Vasquez and Klotz, 2013; Zuo et al., 2012). This notion of welfare is expressed as improvement in quality of human life, viz., access to the basic necessities and facilities, livelihoods and employment, working conditions, health and wellness, provision of justice, support from organizational systems, education and training, (Liu et al., 2016; Pearce, 2006, Valdes-Vasquez and Klotz, 2013). All these issues are inter-related and call for nuanced and specific practices to contribute to SC (Berardi, 2013). Additionally, as will be discussed shortly, the social dimension has intersections with the environmental and economic dimensions as

well. This reveals the greater complexity involved in SC practices, and therefore, the need for more exploratory and applied research in this field. Issues comprising the social dimension, identified from literature, are summarized in Table 1. They pertain to three broad themes focussed on welfare of i) workforce (e.g., S4), ii) the project affected community and end users (e.g., S6 and S9) and, (iii) the wider society (e.g., S2 and S10).

2.2. Environmental dimension

One of the most intensively investigated among TBL dimensions — possibly due to construction industry's role in emissions and destruction of natural environment (Goh and Rowlinson, 2015) — environmental sustainability primarily focuses on reducing the quantum of non-renewable resources, promoting the use of renewable material and energy sources, reducing the amount of waste generated during project lifecycle and protecting the natural environment from destruction associated with construction (Mani and Reddy, 2012; Yılmaz and Bakış, 2015). Many of these issues impinge on social sustainability as well (Hill and Bowen, 1997). For example, the environmental pollution caused by construction negatively affects the health and wellness of both the labour force and the surrounding community. On the positive side, reducing consumption of resources and supporting reuse/recycling of wastes during a project lifecycle will result in lesser extraction of virgin materials and their preservation for future generations, thus facilitating intergenerational equity of social sustainability (Mani and Reddy, 2012). Important issues within environmental dimension are captured in Table 2. While some of them focus on the resources required (e.g., construction material and energy, EN1, EN2), others relate to negative impacts of construction on society and environment (e.g., Pollution, EN3 and Emissions, EN5).

2.3. Economic dimension

Economic sustainability is arguably pursued by all organizations to survive in a competitive environment (Zhou and Lowe, 2003). However, in the context of SC, it calls for sharing the wealth with wider stakeholders for their long term well-being while pursuing short-term shareholders' returns (Agyekum-Mensah et al., 2012; Hill and Bowen, 1997). Economic sustainability is intricately tied up with the other two dimensions constituting TBL. Despite an initial cost premium, the environmentally and socially sustainable construction practices are also economically sustainable (Hill and Bowen, 1997) as they lead to long term benefits for: a) clients, by

providing better lifecycle value for their money (Baloi, 2003), b) contractors, due to reduced waste (and hence costs) and thereby, improved profits, c) suppliers and contractors by providing them fair opportunities in the procurement process (Adetunji et al., 2003), and d) the community at large, due to more employment opportunities and investment in capacity building (Zhou and Lowe, 2003). Issues encapsulated within the economic dimension — pertaining to benefits of SC for organizations (e.g., profitability, EC3) as well as for society (e.g., affordability, EC1 and employment, EC2) — are recorded in Table 3.

The above brief discussion on the three dimensions (TBL) and the issues concerning each of these dimensions serves as the basis for CA of the literature.

3. Research methodology

This study presents a review of SC research literature in the Indian context. A literature review facilitates identification of the available body of knowledge, relevant theories, controversies, and unanswered questions pertaining to any topic (Bryman, 2012). From a methodological perspective, two types of literature reviews exist: a) a narrative or traditional review, and b) a SLR (Cronin et al., 2008; Tranfield et al., 2003). The former focuses on critiquing and summarizing the available body of knowledge, generally without explicit methodological considerations and therefore reflecting, 'the biases of the researcher' (Bryman, 2012, p. 102); the latter calls for more rigour by adopting 'explicit procedures' that allow for higher reliability and replicability (Bryman, 2012; Tranfield et al., 2003). Therefore, SLRs are preferable when a review is used to answer specific research questions rather than just summarizing the literature (Webster and Watson, 2002). As the present study is also directed towards specific questions on SC in India, SLR is considered to be a suitable approach.

SLRs may adopt predominantly qualitative or quantitative approaches depending on the research questions or objectives (Guarnieri et al., 2015). While a quantitative approach can be adopted using meta-analysis — 'to establish whether or not a particular variable has a certain effect by comparing the results of different studies' (Bryman, 2012, p. 106) — CA is suitable for both qualitative and quantitative approaches (Guarnieri et al., 2015; Seuring and Gold, 2012). CA, defined as the method of 'making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use' (Krippendorff, 2004, p.18), allows quantitative inferences generally through frequency analysis while qualitative inferences are obtained by analyzing the text

Table 1
Social issues related to SC.

Issues	References
S1 Social equity and justice for disadvantaged members of society	Berardi (2013); Dempsey et al. (2011); Hill and Bowen (1997); Zuo et al. (2012)
S2 Improvement in quality of human life, especially of disadvantaged groups	Agyekum-Mensah et al. (2012); Baloi (2003); Hill and Bowen (1997); Langford et al. (1999); Zuo et al. (2012)
S3 Poverty alleviation and employment generation	Agyekum-Mensah et al. (2012); DETR (2000); Hill and Bowen (1997); Langford et al. (1999); Pearce (2003); Zuo et al. (2012)
S4 Fair employment practices with a healthy and safe working environment	Adetunji et al. (2003); Berardi (2013); Goh and Rowlinson (2015); Hill and Bowen (1997); Valdes-Vasquez and Klotz (2013); Zuo et al. (2012)
S5 Capacity building and skill enhancement	DETR (2000); Hill and Bowen (1997); Pearce (2003); Zuo et al. (2012)
S6 Stakeholder involvement and open, transparent communication	Adetunji et al. (2003); Hill and Bowen (1997); Kaatz et al. (2006); Valdes-Vasquez and Klotz (2013); Zuo et al. (2012)
S7 Concern for end users' accessibility, health, safety, security and productivity	Sarkis et al. (2012); Valdes-Vasquez and Klotz (2013)
S8 Preserving local culture and heritage	Adetunji et al. (2003); Berardi (2013); Cheng et al. (2015)
S9 Reducing ill effects of construction on users and surrounding community	Valdes-Vasquez and Klotz (2013); Wells (2003); Zuo et al. (2012)
S10 Intergenerational equity	Hill and Bowen (1997); Langford et al. (1999)

Table 2
Environmental issues related to SC.

Issues	References
EN1 Extracting materials at rate lower than redeposit rate	Hill and Bowen (1997); Mani and Reddy (2012)
EN2 Reduction in energy, water, land and material consumption through life cycle consideration	Agyekum-Mensah et al. (2012); Adetunji et al. (2003); Baloi (2003); Berardi (2013); DETR (2000); Goh and Rowlinson (2015); Hill and Bowen (1997)
EN3 Minimising pollution due to construction	Adetunji et al. (2003); DETR (2000); Goh and Rowlinson (2015); Hill and Bowen (1997)
EN4 Using non-toxic and environment friendly material	Goh and Rowlinson (2015); Hill and Bowen (1997); Langford et al. (1999); Plank (2008)
EN5 Minimization of carbon emissions, carbon footprint and waste through lifecycle assessment	Agyekum-Mensah et al. (2012); Adetunji et al. (2003); Baloi (2003); DETR (2000); Goh and Rowlinson (2015); Langford et al. (1999)
EN6 Reducing damage to aliveness, diversity and natural, life support systems of earth	Adetunji et al. (2003); DETR (2000); Hill and Bowen (1997); Yılmaz and Bakış (2015)
EN7 Sustainable usage of renewable sources	Adetunji et al. (2003); Yılmaz and Bakış (2015)
EN8 Minimization of waste through recycle and reuse of resources	Goh and Rowlinson (2015); Hill and Bowen (1997); Langford et al. (1999); Plank (2008)

Table 3
Economic issues related to SC.

Issues	References
EC1 Financial affordability of facility for intended users (like affordable/ social housing)	Hill and Bowen (1997)
EC2 Employment creation	Agyekum-Mensah et al. (2012); Baloi (2003); Hill and Bowen (1997); Langford et al. (1999)
EC3 Improved profitability and competitiveness by increasing output, productivity and reducing input (resources)	Adetunji et al. (2003); Agyekum-Mensah et al. (2012); Baloi (2003); DETR (2000); Hill and Bowen (1997); Langford et al. (1999); Zhou and Lowe (2003)
EC4 Investing a part of earning for development of human and social capital	Hill and Bowen (1997); Langford et al. (1999)
EC5 Selecting environmentally conscious suppliers and contractors	Hill and Bowen (1997)
EC6 Ethically sourced products and services	Agyekum-Mensah et al. (2012)
EC7 Lifecycle consideration in costing	Goh and Rowlinson (2015); Hill and Bowen (1997)
EC8 Better value of money for the facility due to reduced cost of construction, operation and maintenance.	Adetunji et al. (2003); Baloi (2003); Zhou and Lowe (2003)

under consideration (Seuring et al., 2005). As the present study involved quantitative assessment (of publication trends) as well as qualitative assessment (of TBL focus and the research gaps), CA was selected as the methodology for conducting SLR. The qualitative-quantitative analyses complement each other and provide a comprehensive map of the literature (Seuring et al., 2005). CA has been commonly used to this effect in SC research for investigating: construction companies' attitude to sustainability (Myers, 2005); corporate approaches to sustainability (Jones et al., 2010), and owners' sustainability requirements in design-build projects (Xia et al., 2014).

Here, the SLR has been conducted using Seuring et al.'s (2005) four step procedure for CA. These four steps are: a) literature collection; b) descriptive analysis c) category selection, and d) literature evaluation. A similar procedure has been used for performing SLRs in various areas including: third party logistics (Marasco, 2008); sustainability oriented innovation (Klewitz and Hansen, 2014) and supply chain management (Seuring and Gold, 2012).

3.1. Literature collection

Search for relevant articles was conducted in the following electronic academic databases: American Society of Civil Engineers (ASCE), Science Direct, Emerald, ABI/INFORM (via Proquest), Taylor and Francis, and Google scholar. Keywords used in the search included 'construction', 'project', 'India' along-with each of the following words: 'sustainability', 'sustainable', 'green', 'corporate social responsibility', 'responsible business'. Search was performed in the Title, Keywords and Abstract sections of the databases except for Google scholar and ASCE for which search option was available in Title section. For comprehensive coverage, no time limit was applied and articles published till December 2017 were covered.

A pre-specified protocol to shortlist relevant articles from the initial search results is necessary in a SLR for removing biases and facilitating replications (Tranfield et al., 2003). Accordingly, the following protocol is used here:

a) Based on Webster and Watson's (2002) suggestion that articles from journals and reputed conference proceedings should be considered in literature reviews for a comprehensive coverage of an emerging topic, articles from these two sources were included. Other publications like book chapters, trade journals, reports and online articles were excluded. To ensure academic rigour, only conference proceedings articles from reputed publishers or organizations (e.g., ASCE, Elsevier, Engineering Project Organization Society) were only considered.

b) The target articles should have i) been published in English language, ii) focused on building or infrastructure projects in the Indian context and, iii) dealt with any issue(s) pertaining to SC (Tables 1–3). To this end, the abstracts of the articles obtained through keyword search were read and articles were screened based on four filtering criteria (Zhou and Mi, 2017) (see Table 4). Further, following the suggestion of Derakhshan et al. (2019) to involve more than one author in the 'relatively subjective' inclusion/exclusion decision for better reliability, this exercise was carried out by the first author and then independently reviewed by the second author. The final decision was based on agreement between the authors.

As per Leiras et al. (2014), a database search should be followed by a manual search for a comprehensive search output. Accordingly, the reference lists of articles shortlisted after the initial database search were used to obtain additional articles meeting the search protocol. Using this process, a sample comprising of 62 articles was finalized and used in further analysis.

Table 4
Filtering criteria used for screening the articles.

Sl. No	Filtering criteria	Example of excluded articles
1	The term 'construction' was used in a study which focussed on sectors other than building and civil engineering.	• Dey et al. (2018) assessed the impact of haphazard 'construction' on the tourism potential of an Indian city. • Priti Sanga and Ranjan Kumar (2014) investigated rural livelihood in agricultural sector, with 'construction of rural infrastructure' as one of the factors.
2	The term 'India' was used in a study rooted in a context outside India.	• Fry (2013) investigated cement production led emissions in Mexico and referred to the groups of countries like 'India, Africa, Southeast Asia and Latin America' as drivers of global cement consumption.
3.	The term 'project' was used to denote distinct project types other than the building and civil engineering projects.	• Ambekar and Hudnurkar (2017) investigated 'six-sigma projects' in manufacturing industry in India to identify latent 'construct' of barriers.
4.	The term 'sustainable' or 'sustainability' were used in a context other than the building and civil engineering projects.	• Zhang et al. (2013a) measured dynamic capability as 'construct' for 'sustainable' competitive advantage in pharmaceutical industry in China and India. • Rajagopalan and Srivastava (2018) reported improved 'sustainability' in information technology projects by using a 'construct' called 'project health index'.

3.2. Descriptive analysis

The collected literature was classified based on source, chronological order and methodology to reveal the publication trends (Seuring et al., 2005). This analysis (discussed in Section 4 and 5) provided insights into the progress of research in SC in India in terms of established researchers, preferred research sources and temporal patterns in the evolution of the body of knowledge.

3.3. Category selection

In CA, the category selection can be through an inductive or a deductive approach. In the inductive approach, categories are *developed* based on generalizations from the collected literature and in the deductive approach categories are *selected* or *specified* even before the collected literature is analysed (Seuring et al., 2005). Here, the deductive approach is used with categories informed by the TBL model of SC (Berardi, 2013; Goh and Rowlinson, 2015; Hill and Bowen, 1997) and sustainable project management literature (Gareis et al., 2013; Silvius et al., 2012). The deductive approach has been preferred here over the inductive as it facilitates identification of research gaps in the analysed literature vis-à-vis the broader theory and also allows for generalization of the conclusions drawn from analysing literature to existing theory (Leiras et al., 2014; Seuring et al., 2005; Seuring and Gold, 2012). The selected categories are presented in the form of a conceptual framework (Fig. 1) for better visualization of the overall schema (Leiras et al., 2014) and described below briefly:

3.3.1. Basic paper information (C1)
Includes the source, year of publication and author information.

3.3.2. Research method (C2)
The classification used by Chatha et al. (2015) is followed and papers are classified as either empirical or conceptual. Both primary and secondary data are considered under empirical research, which is further classified as empirical-qualitative and empirical-quantitative. Papers involving theoretical models, frameworks, mathematical models, opinion pieces or literature reviews without any qualitative or numeric data collection are classified as conceptual. Mathematical models based on hypothetical data to develop and test new methods are classified as conceptual-quantitative while those dealing with literature reviews or theoretical frameworks are conceptual-qualitative. Overall, the articles were classified based on four combinations of research methods:

empirical-qualitative, empirical-quantitative, conceptual-qualitative and *conceptual-quantitative* (Nakata and Huang, 2005).

3.3.3. SC dimensions (C3)
These are the three dimensions constituting the TBL, viz., social, environmental and economic. This category indicates if all three dimensions appear in the literature. A balanced treatment of these three dimensions, which can be generally arrived at through tradeoffs, is a necessary condition for SC (Du Plessis and Brandon, 2015). The articles in the sample were analyzed for their orientation to one or more of these dimensions.

3.3.4. Social issues (C4)
This dimension of SC consists of multiple issues that are comparatively less researched than those under the other two dimensions (Valdes-Vasquez and Klotz, 2013). Social issues S1 to S10 identified in Section 2 (see Table 1) are included in this category and the same are used to classify the articles.

3.3.5. Environmental issues (C5)
Ofori (2000a,b, 2015) highlighted the large scale environmental destruction caused by construction in the developing countries and recommended mitigation measures through SC. Various environmental issues, EN1 to EN8, which are presented in Section-2 (see Table 2) are used for classification.

3.3.6. Economic issues (C6)
Zhou and Lowe (2003) stress on economic sustainability as a key component of SC as it allows key stakeholders in the construction industry to pay attention to the social and environmental dimensions while also meeting their long term financial goals. To identify orientation of articles in the sample towards economic sustainability, they were analyzed against the issues under this category (EC1 to EC8, see Table 3).

3.3.7. Level of analysis (C7)
Past research suggests that SC implementation can be driven by efforts of an individual, like designer or project manager (Mills and Glass, 2009; Tabassi et al., 2016); organizational policies and practices, like environment management system (Yusof et al., 2016; Zuo et al., 2012); project specific measures, like use of local resources (Gupta, 2017); or industry led initiatives like improved professionalism to attract skilled talent (Wong et al., 2012). Accordingly, under this category papers were classified to be dealing with SC at *individual* level, *project* level, *organization* level,
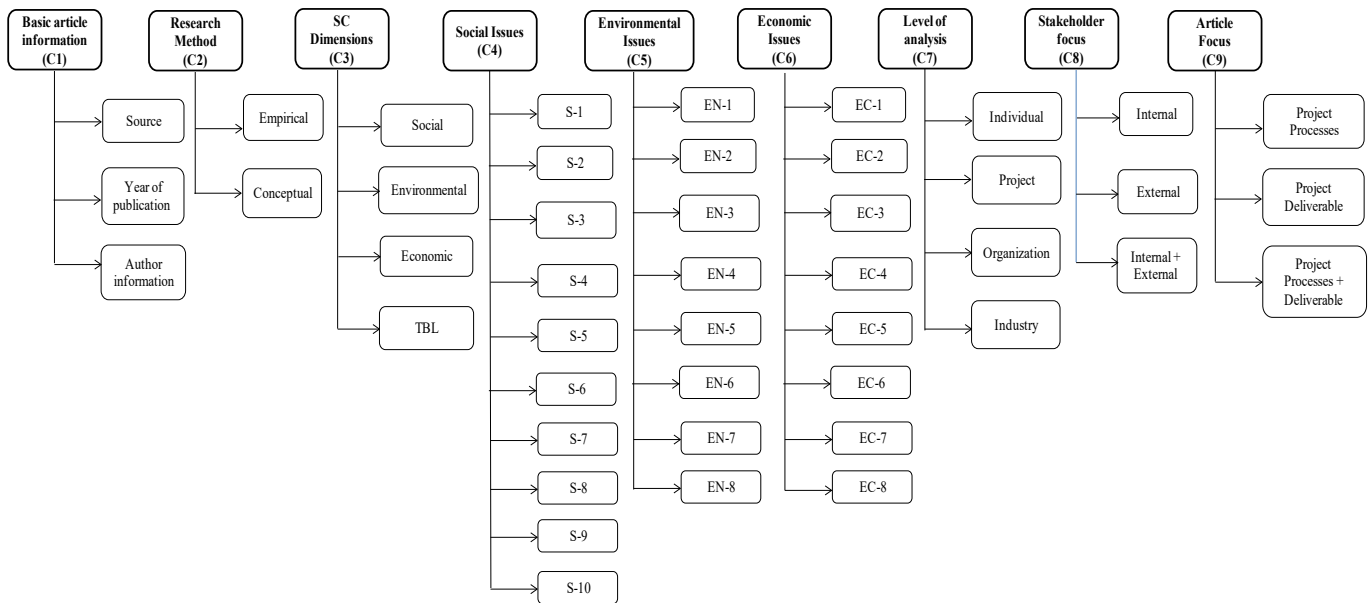
Fig. 1. Overall Schema of literature categorization.

or broader (*macro*) *industry* level.

3.3.8. Stakeholder focus (C8)

A construction project includes multiple stakeholders classified as *internal* and *external* stakeholders. The former includes actors involved in financing, managing and executing the project and the latter includes those not directly involved in project activities (Olander, 2006). Sustainability principles call for equal focus on needs and expectations of external stakeholders as well as the internal ones (Silvius et al., 2012). Based on Olander (2006), client, contractor, consultant, suppliers, sub-contractors (with labour) and end users are considered as internal stakeholders and government bodies, NGOs, affected community and general public are considered as external stakeholders. This category was used to identify and classify the articles based on their respective stakeholder orientation.

3.3.9. Article focus (C9)

Silvius et al. (2012) suggest that sustainability in projects can be integrated in the *process* of production or the final project *deliverable*. Examples of the former category include stakeholder management, labour practices and procurement, whereas construction materials, technology, design considerations for energy, water and material efficiency of the final structure and construction and demolition waste are examples of the latter (Agyekum-Mensah et al., 2012; Silvius et al., 2012). While focus on both processes as well as deliverables is essential to achieve sustainability (Huemann and Silvius, 2017), review of project sustainability literature by Aarseth et al. (2017) revealed predominant focus on the deliverables (e.g., construction materials). Accordingly, this category has been used to classify articles based on their focus on project *deliverable*, project *processes* or *both*.

3.4. Literature evaluation

The collected literature sample is evaluated using categories selected in the previous step. While the categories have been selected deductively from previous literature, some academic judgement is still involved (Seuring and Gold, 2012). Krippendorf (2004) also suggested that category selection and definition is 'an art'. However, the deductive approach reduces the ambiguity associated with category selection (Leiras et al., 2014) and facilitates better reliability and validity (Seuring and Gold, 2012).

The deductive approach is also recommended by Hsieh and Shannon (2005) when sufficient prior research is available to select and define the categories clearly. Theory-driven and clearly defined categories allowed discussions and agreement among all three authors, thus improving reliability and internal validity of the process. This is as per Seuring and Gold's (2012, p. 547) recommendation that 'By involving several researchers into content analysis, validity and reliability of (literature) sampling and data analysis may be broadly enhanced'. Accordingly, all categories were selected by the first author and subsequently reviewed by the other two authors independently. Therefore, these theoretically rooted abstract categories allow sufficient scope for generalization of conclusions drawn from them, therefore improving the external validity (Seuring and Gold, 2012).

4. Results-findings

4.1. Basic article information

The trend line from the yearly distribution of articles (Fig. 2) shows a strong increase in publication numbers in the current
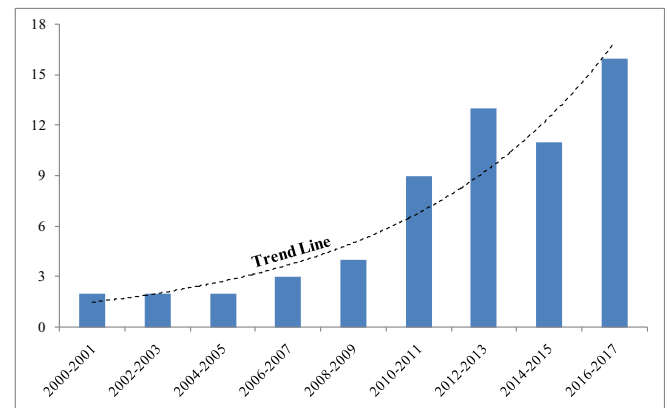

Fig. 2. Chronological spread of articles in the literature sample.

decade, with the highest number of articles from 2016 to 2017. Of the 62 articles in this sample, 48 articles (77%) are from journals and 14 articles (23%) are from conference proceedings. 3 articles each have been published in *Buildings and Environment* and *Environmental Impact Assessment Review* and 2 articles each have been published in *Construction Management and Economics, Energy and Buildings, Impact Assessment and Project Appraisal, and Journal of Engineering, Design and Technology*. The remaining 32 articles were spread across 32 journals. This indicates a vast spread in the published journal articles concerning SC in India. The articles have been authored by both Indian as well as foreign authors and there are five authors with three or more papers in the collected sample (refer Table 5).

The author with the most articles — four —is from IIT Madras, India. Interestingly, 10 articles (16%) are authored by researchers affiliated with institutes outside India, 5 articles (8%) by Indian authors with foreign collaboration and the remaining 47 papers by researchers having Indian affiliation. Overall, 36 authors with foreign affiliations were noted in the review.

4.2. Research method

Fig. 3 shows the distribution of papers based on the research method typology described in Section 3. It also provides a sub-classification for each TBL dimension. A majority of the articles are empirical-quantitative followed by empirical-qualitative and conceptual-qualitative. The research on the environmental dimension is largely quantitative while that on the social dimension is qualitative. This supports earlier claims that indicators for quantitative assessment of social sustainability are less clearly defined (Valdes-Vasquez and Klotz, 2013). Fig. 4 presents the classification of articles based on the method of primary data collection. 39 (80%) empirical articles are based on primary data mostly collected through interviews followed by field survey, questionnaire survey and experiments.

4.3. SC dimensions

Fig. 5 presents the TBL based article classification and clearly illustrates that the environmental dimension has been the focus area with 63% (39) articles, followed by the social (47%, 29 articles) and economic (23%, 14 articles) dimensions. The chronological spread of articles for each of the three dimensions (Fig. 6) suggests that research on all three dimensions has increased over the years; however articles on the environmental dimension outnumber those on the other two dimensions.

4.4. Social issues

This category includes ten social issues S1 to S10 within SC. Table 6 maps the available literature, which is spread across the three themes pertaining to workforce, affected community and end users, and wider society. However, studies dealing with community related issues S6 and S9 (e.g., Diduck et al., 2007; Rajaram and Das, 2006; Routlegde, 2003; Diduck et al., 2013) are largely from

hydropower projects with very few studies focused on areas like urban-redevelopment (e.g., Kumar et al., 2016) and public-private partnerships (e.g., Delhi et al., 2010). A common thread across these articles is insufficiency of environmental impact assessment (EIA) processes to address concerns of local communities and adverse impact of projects on them. Articles on workforce related issues S2 and S4 bring to light complete disregard for labour welfare, health and safety concerns by clients and contractors and denial of basic needs like clean drinking water, hygienic sanitation and decent labour tenements. The construction industry's contribution to wider society through poverty reduction and capacity building (S5 and S3) has been addressed by only a few researchers. Yet, these issues hold significance for India considering that Ofori (2000a, 2015) strongly suggests that sustainable construction practices could be the source of economic self-sufficiency for millions of disadvantaged people in developing countries.

4.5. Environmental issues

Table 6 presents the spread of literature across EN1 to EN8. It illustrates the focus on both themes relating to impacts created by construction projects and the resources required for the same. Yet, there is imbalance in the coverage of issues under each theme. Resource related issues EN2 and EN8 are the most investigated environmental issues with large relevant publications while no articles on EN4 and EN7 were found in the sample. The common impressions obtained through articles in both the themes are: lack of reliable data, poor awareness and skills regarding SC, resistance to change, continued usage of traditional methods and incorrect lifecycle assessments of buildings. These problems are collectively resulting in overdesign and over specification thereby causing wastage (Arif et al., 2009; Bardhan, 2011), which contributes significantly in making the construction sector one of the largest emitter of green house gases in India (Francis and Mahalingam, 2012). Extremely high rates of raw materials extraction (Mani and Reddy, 2012) and the huge amount of construction waste illegally dumped in open spaces (Antony and Nair, 2016; Dakwale and Ralegaonkar, 2014) have also caused severe damage to natural formations like riverbeds, lakes, rocky outcrops, etc. (Kumar and Katoch, 2016).

4.6. Economic issues

The least investigated of the TBL, articles on this dimension were found to focus only on possible benefits of SC for society (e.g., EC1 and EC2) while no research on validating benefits of such practices for organizations is available (Table 6). Articles on EC2 (e.g., Wuttke and Vilks, 2014; Jumani et al., 2017) reaffirm the construction industry's role as one of the largest employment creator in India, especially for unskilled labour. However, the manual labour driven construction methods contribute to higher construction cost, pushing the housing affordability ratio and hence negatively affecting the affordability of constructed facilities (EC1) (Goel, 2016; Tiwari and Parikh, 2000). Recommendations to reduce cost and improve lifecycle value include policy initiatives to cover upfront

Table 5
Author details (three or more articles).

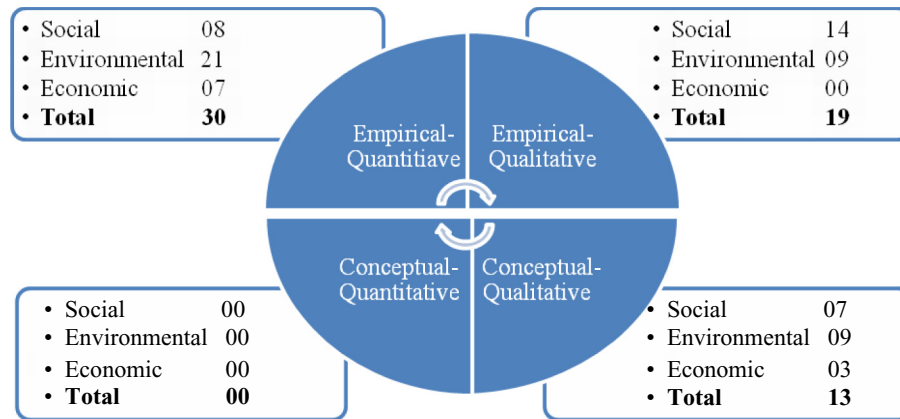| Author	Affiliation	Number of articles	Authored articles
A. Mahalingam	IIT Madras, India	4	Delhi et al. (2010); Doloi et al. (2014); Francis and Mahalingam (2012); Kumar et al. (2016)
S. N. Kalidindi	IIT Madras, India	3	Doloi et al. (2014); Loganathan and Kalidindi (2016); Ramaswamy and Kalidindi (2009)
K. N. Jha	IIT Delhi, India	3	Tabish and Jha (2011, 2012); Vyas and Jha (2016)
M. Arif	University of Salford, UK	3	Arif et al. (2009, 2012); Potbhare et al. (2009)
S. Bardhan	Jadavpur University, India	3	Bardhan (2011, 2015); Bardhan and Choudhuri (2016)

• Social 08			• Social 14
• Environmental 21			• Environmental 09
• Economic 07			• Economic 00
• **Total** **30**			• **Total** **19**

Empirical-Quantitiave | Empirical-Qualitative

Conceptual-Quantitative | Conceptual-Qualitative

• Social 00			• Social 07
• Environmental 00			• Environmental 09
• Economic 00			• Economic 03
• **Total** **00**			• **Total** **13**

Fig. 3. Article classification based on research method.

N=62

Empirical = 49 | Conceptual = 13

Primary data = 39 | Secondary data = 10

Interviews = 16 | Field survey = 10 | Questionnaire survey = 10 | Experiments = 3
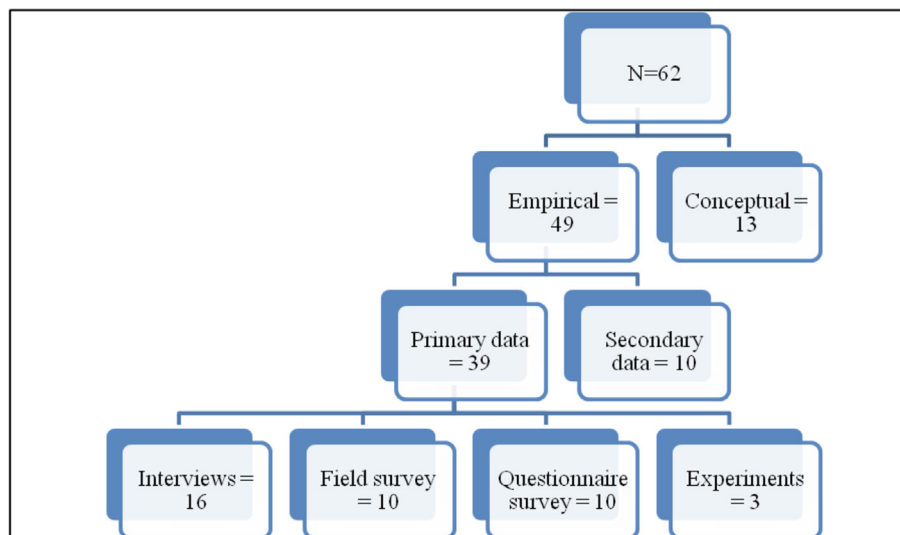
Fig. 4. Classification of articles based on methods of primary data collection.

Social + Environmental + Economic
8 articles
13%

Social + Environmental
1 article
1.5%

Social
19 articles
31%

Environmental
28 articles
45%

Economic
3 articles
5%

Social + Economic
1 article
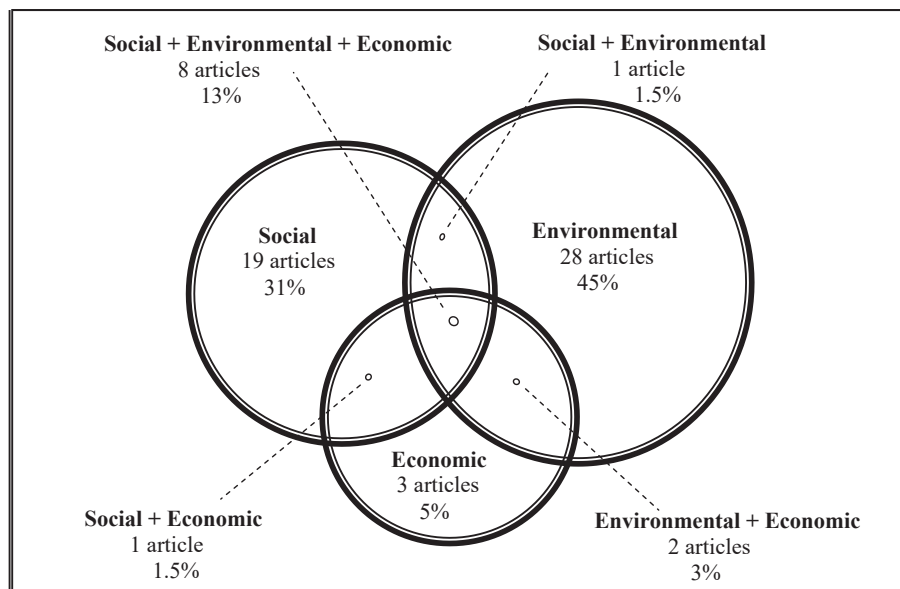1.5%

Environmental + Economic
2 articles
3%

Fig. 5. TBL based distribution of articles (N = 62).
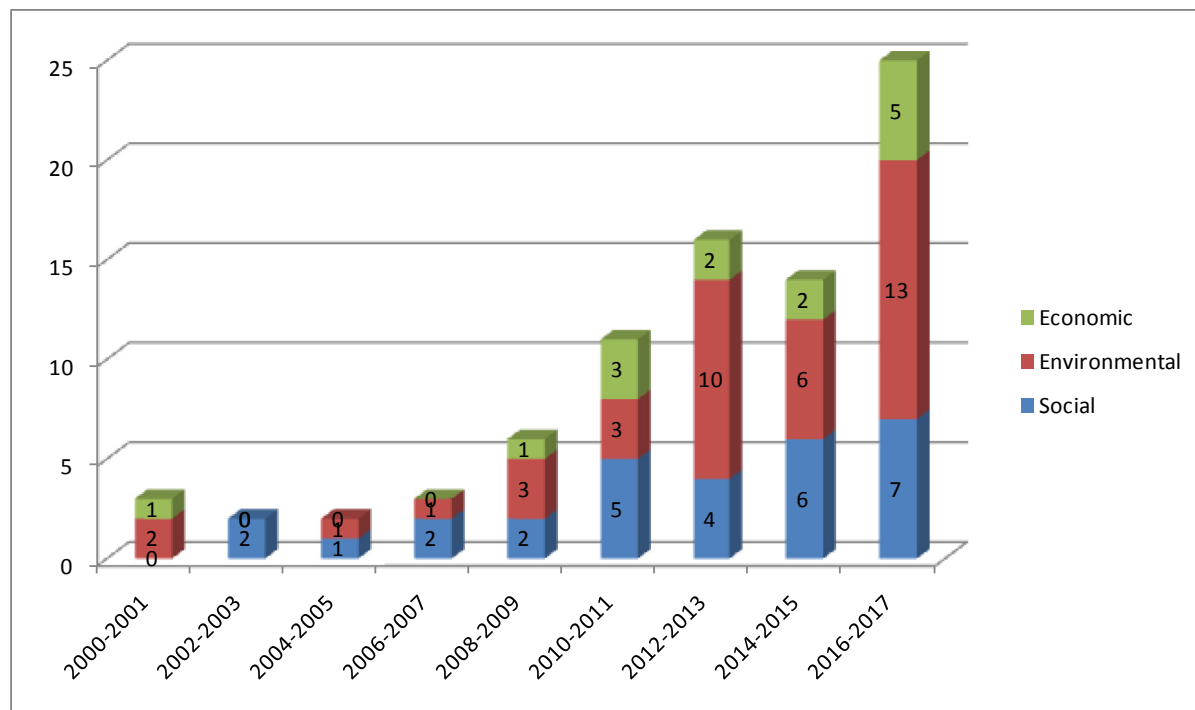
Fig. 6. TBL based chronological distribution of articles.

cost and adopting sustainable procurement practices (EC5) (Patil and Laishram, 2016, 2017). In the same context, Tabish and Jha (2011, 2012) investigated irregularities in public procurement and suggested a framework for ethical sourcing (EC6).

4.7. Level of analysis

42 articles (68%) investigated SC at the macro-industry level and 20 articles (32%) at the project level. No article investigating SC at the individual or organizational level is present in the collected sample. Fig. 7 presents the level of analysis followed for each dimension. For the social dimension, research at the project level mostly pertains to labour employment practices (S4) (e.g., Loganathan and Kalidindi, 2016; Ray et al., 2015) and stakeholder involvement (S6) (e.g., Doloi et al., 2014; Kumar et al., 2016); and at the industry level, it relates to quality of life (S2) (e.g., Nawre, 2013; Wuttke and Vilks, 2014) and capacity building (S5) (e.g., Kakad, 2002; Wuttke and Vilks, 2014).

For the environmental dimension, a majority (30 out of 39) of the articles dealt with SC at the industry level and focussed on; sustainability assessment (e.g., Bhatt and Macwan, 2011; Potbhare et al., 2009; Sharma et al., 2012); efficient use of energy, water, materials and land (EN2) (e.g., Bardhan, 2011; Gupta, 2017; Kini et al., 2017); and minimising waste by recycle/reuse (EN8) (e.g., Bagdhi et al., 2013; Dakwale and Ralegaonkar, 2014; Surya et al., 2013).

Under the economic dimension, most research papers are at the industry level and focus on: affordability of facilities (EC1) (e.g., Goel, 2016; Tiwari and Parikh, 2000); ethical sourcing (EC6) (e.g., Tabish and Jha, 2011, 2012), and selection of environmentally conscious suppliers (EC5) (e.g., Patil and Laishram, 2016, 2017). Jumani et al. (2017) presented the only study at the project level in which they explored employment generation (EC2) due to small hydropower projects.

4.8. Stakeholder focus

Explicit focus on one or more stakeholders was identified in 37 articles (Fig. 8) based on the role of specific stakeholders to promote SC in India. For example, Patil and Laishram (2016, 2017) discussed the role of public clients in promoting SC through procurement. 18 articles (48%) focussed on internal stakeholder, 8 articles (22%) on external stakeholders, and 11 articles (30%) considered both internal and external stakeholders. It is evident (see Fig. 8) that internal stakeholders remain the main focus of SC research in India across all three dimensions. Table 7 maps the collected literature across different stakeholders and also specifies the context in which a particular stakeholder is covered.

The top three stakeholders in terms of literature focus (number of papers) are affected community, client and construction labour. The remaining 25 articles focussed on various procedures instead of any specific stakeholder. For example, environmental issues EN2 (KiranKumar et al., 2017; Praseeda et al., 2015; Tiwari, 2001) and EN8 (Arif et al., 2012; Pappu et al., 2007; Surya et al., 2013).

4.9. Article focus

Table 8 presents the classification based on this category. A greater research focus on deliverables is present in India with most articles dealing with technologies for EN2 and recycling/reuse of construction waste, EN8. On the process side, a majority of the papers focus on S4 and S6.

Very few articles had focussed on both the processes and the deliverables. They dealt with socio-economic and environmental issues like S6, S9, EN6 and EC2. These articles pertain to: a) EIA system in India; b) sustainability assessment which includes both social and environmental criteria; and c) sustainable procurement which considers procurement as a suitable tool to achieve SC in India.

Table 6
Integrated mapping of TBL issues in the literature sample.

	Workforce related		Affected community and end user related				Wider society related			
	S4	S5	S6	S7	S8	S9	S1	S2	S3	S10
Social Issues[a]	Cotton et al. (2005); Bansal (2011); Bhatt and Macwan (2011); Tiwary and Gangopadhyay (2011); Beriha et al. (2012); Parida and Ray (2015); Ray et al. (2015); Loganathan and Kalidindi (2016); Parashar et al. (2017)	Kakad (2002); Barnabas et al. (2009); Baruah (2010)	Routlegde (2003); Rajaram and Das (2006); Diduck et al. (2007); Delhi et al. (2010); Diduck et al. (2013); Choudhury (2014); Doloi et al. (2014)	—	—	Routlegde (2003); Rajaram and Das (2006); Diduck et al. (2007); Delhi et al. (2010); Kumar et al. (2016); Kumar and Katoch (2016)	—	Cotton et al. (2005); Tiwary and Gangopadhyay (2011); Beriha et al. (2012); Nawre (2013); Wuttke and Vilks (2014)	Wuttke and Vilks (2014)	—

	Resource related					Impact related		
	EN1	EN2	EN4	EN7	EN8	EN3	EN5	EN6
Environ-mental Issues[a]	Mani and Reddy (2012)	Tiwari (2001); Reddy (2004); Arif et al. (2009); Bhattacharjee (2010); Bardhan (2011); Bhatt and Macwan (2011); Sharma et al. (2012); Komurlu et al. (2014); Bardhan (2015); Praseeda et al. (2015); Bardhan and Choudhuri (2016); Gupta (2017); Kini et al. (2017) Kiran Kumar et al. (2017)	—	—	Pappu et al. (2007); Arif et al. (2009); Ramaswamy and Kalidindi (2009); Arif et al. (2012); Mani, and Reddy (2012); Bagdi et al. (2013); Surya et al. (2013); Dakwale and Ralegaonkar (2014); Antony and Nair (2016); Ghosh et al. (2016)	Francis and Mahalingam (2012); Sharma et al. (2012); Sreedhar et al. (2016)	Arif et al. (2009); Francis and Mahalingam (2012); Sharma et al. (2012); Sreedhar et al. (2016)	Rajaram and Das (2006); Mani, and Reddy (2012); Erlewein (2013); Kumar and Katoch (2016); Rathi (2017); Jumani et al. (2017)

	Organizational benefit related		Societal benefit related					
	EC3	EC8	EC1	EC2	EC4	EC5	EC6	EC7
Economic Issues[a]	—	—	Tiwari and Parikh (2000); Goel (2016)	Wuttke and Vilks (2014); Jumani et al. (2017)	Wuttke and Vilks (2014)	Patil and Laishram (2016, 2017)	Padhi and Mohapatra (2011); Tabish and Jha (2011, 2012)	—

[a] No indications could be gathered from literature sample regarding S1, S7, S8, S10, EN4, EN7, EC3, EC7 and EC8. The citations have been chronologically organized under each issue.
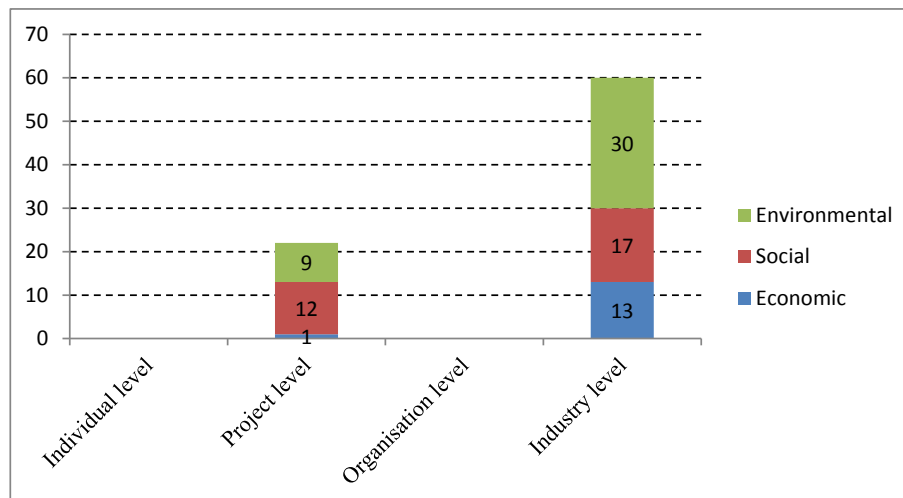
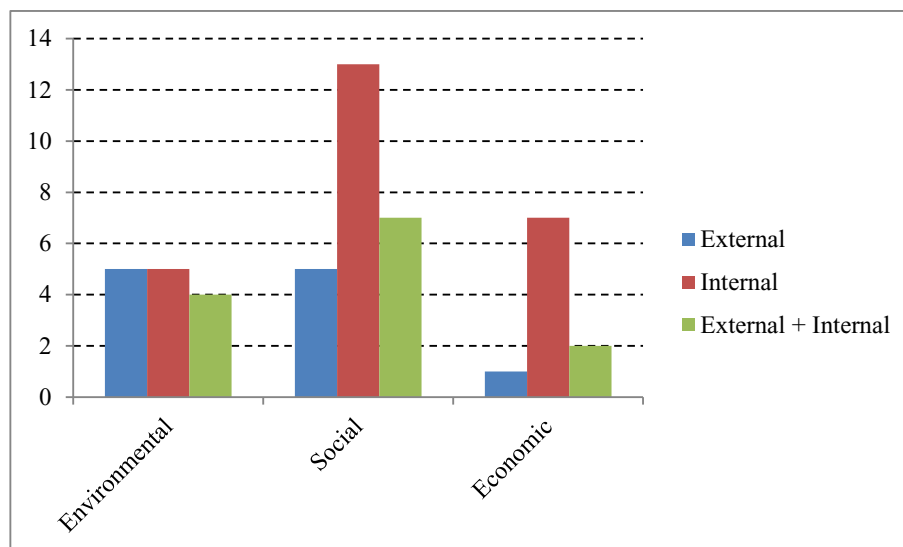**Fig. 7.** Classification of articles based on level of analysis.

Fig. 8. Stakeholder focus based distribution of articles.

5. Discussion and directions for future research

A content analysis based systematic review of research on SC in India is presented here. 62 articles selected from journals and conference proceedings have been examined. Based on CA framework consisting of nine categories — selected deductively from the extant SC literature — the articles have been analyzed to extract the key research trends, focus on TBL dimensions and issues, to identify research gaps and to provide directions for future research. The results of the CA (section 4), are discussed here.

5.1. Publication trends

To answer the question RQ1(a), each article was analyzed with reference to categories C1 to C3 of the CA framework (Fig. 1). A consistent increase in the number of articles has been noted from early 2000s with 64.5% (40) articles published during 2010–2017. Though promising, this trend also points to a considerable lag in the focus on SC in India compared to developed economies that initiated such explorations after publication of the 1987 'Brundtland

report' (Du Plessis, 2007). Even other developing economies like China have long preceded India in SC research (see for e.g., Chan and Shimou, 1999; Roberts and Chan, 1997). Despite this late beginning, the global implications of India's construction output growth have attracted the attention of the global research fraternity. While 5 authors from Indian institutions are the top contributors (having 3 or more papers), interest of global community in India's SC research agenda is exemplified by involvement of 36 authors having institutional affiliations outside India — from Germany (10), UK (9), USA (7), Canada (4), Australia (2), Turkey (2), Japan (1) and Singapore (1) — in the articles covered in this review.

80% (39) of the articles in the sample are empirical, dominated by qualitative approaches with interviews being the most commonly used method of data collection. More specifically, articles on the social dimension constituted 65% of all articles that adopted qualitative approaches. As research approaches indicate the maturity of underlying theory (Edmondson and McManus, 2007), the qualitative orientation of SC research in India points to weak SC theory in this context, particularly lacking in established constructs and corresponding variables for the social dimension. In

Table 7
Stakeholder focus in articles.

Stakeholder classification	Stakeholder	Context	No. of articles	% of articles	Representative literature
Internal	Client (public)	Ethical sourcing and sustainable procurement	10	16%	Padhi and Mohapatra (2011); Patil and Laishram (2016, 2017); Tabish and Jha (2011, 2012)
	Labour	Labour health and safety issues	9	14.5%	Bansal (2011); Beriha et al. (2012); Cotton et al. (2005); Parida and Ray (2015); Ray et al. (2015)
	Contractor	Undertaking SC practices and promoting sub-contractors to do so	4	6.5%	Beriha et al. (2012); Cotton et al. (2005); Ghosh et al. (2016); Loganathan and Kalidindi (2016)
	End users	Affordability of facilities and user involvement in project development	4	6.5%	Doloi et al. (2014); Goel (2016)
	Labour (female)	Discrimination and bias against female workers	3	4.8%	Barnabas et al. (2009); Baruah (2010); Kakad (2002)
	Client (public or private)	Demanding SC practices in their projects	3	4.8%	Arif et al. (2009); Cotton et al. (2005); Goel (2016)
	Design consultants	Formulating India specific sustainability assessment framework	1	1.6%	Bhatt and Macwan (2011)
External	Affected community	Negative impacts of construction and community participation to reduce such impacts	13	21%	Diduck et al. (2013); Jumani et al. (2017); Kumar et al. (2016)
	NGOs	Bridge between project proponents and society. Improving public awareness	4	6.5%	Baruah (2010); Rajaram and Das (2006)
	Regulatory bodies	Ensuring enforcement of environmental and social regulations	1	1.6%	Komurlu et al. (2014)

Table 8
Process-Deliverable classification of articles.

Process/Deliverable focus	Issues addressed	No. of articles	% of articles	Representative literature
Only Deliverable	EN2 EN5 EN8	30	48.3%	Gupta (2017); Kini et al. (2017) Kiran Kumar et al. (2017) Sharma et al. (2012); Sreedhar et al. (2016) Dakwale and Ralegaonkar (2014); Antony and Nair (2016); Ghosh et al. (2016)
Only Process	S2 S3 S4 S5 S6 EC5 EC6	25	40.3%	Beriha et al. (2012); Nawre (2013); Wuttke and Vilks (2014) Wuttke and Vilks (2014) Loganathan and Kalidindi (2016); Parashar et al. (2017) Barnabas et al. (2009); Baruah (2010) Diduck et al. (2013); Choudhury (2014); Doloi et al. (2014) Sharma et al. (2012); Sreedhar et al. (2016) Kumar and Katoch (2016); Rathi (2017)
Process + Deliverable	Various Issues across TBL	7	11.3%	Bhatt and Macwan (2011); Jumani et al. (2017); Patil and Laishram (2016); Potbhare et al. (2009); Rajaram and Das (2006)

contrast, the worldwide research is moving towards identification of context-specific indicators for social sustainability (see for e.g., Li et al., 2017 for China and Sierra et al., 2016 for Chile). Therefore, India-centric social sustainability indicators need to be explored, prioritized, and validated.

5.2. TBL focus of research

The orientation of each article towards the TBL dimensions was noted to answer RQ1(b). 63% articles targeted the environmental dimension compared to 47% and 23% articles on social and economic dimensions respectively. Further, the number of environment focussed articles have grown faster compared to other dimensions (Fig. 6). This trend is interesting considering Adams' (2006) caution that while all three dimensions should be equally focussed upon; economic concerns far outweigh environmental concerns in reality. The data indicates that at least in terms of research, the focus in India is firmly on the environmental dimension. This may be due to the government's thrust — resulting from international pressure on large developing economies like India and China — to reduce the green house emissions, 24% of

which are attributed to the built environment (EPF, 2016). This also agrees with Ofori (2000a, 2015) that the fragile natural environment in fast developing economies needs special attention in research. Overall, only 8 articles (13%) investigated SC holistically, covering TBL while 4 articles dealt with more than one dimension. Hence, there is a need for better integration of the three dimensions in further research to facilitate a comprehensive sustainability assessment of construction practices in India. In the last two decades, such attempts have already been made in other developing economies, like China (Sha et al., 2000), South Africa (Hill et al., 2002), Brazil (Gomes et al., 2008), and Malaysia (Zainul Abidin, 2010b).

5.3. Thrust areas of current research and research gaps

To answer RQ2, all articles in the sample were evaluated against categories C4 to C9 of the CA framework (Fig. 1) and an integrated map of available literature vis-à-vis SC issues was developed (see Table 6). This map illustrates a serious imbalance in academic pursuit of SC in India with larger number of publications on the environmental dimension. Consistent with this environment

centric research focus, reduction in energy consumption, emissions and waste, and minimising damage to natural environment (EN2, EN5 and EN8) are found to be the most thoroughly investigated issues. These are followed by social issues of labour employment practices, community participation and safety (S4, S6 and S9). The research on economic issues has been most sparse.

Within the social dimension, articles under the workforce related theme highlight exploitative nature of employment practices (S4) in India, yet they do not present a comprehensive picture as the viewpoint of workers, especially unskilled labour, is not adequately addressed. Primary data collected in situ from workers should be more valuable. Under the affected community and end users theme, issues S6 and S9 have many articles but the discussion is largely confined to hydropower projects. So, these issues should be investigated for other large infrastructure projects (or mega projects) like highways, airports, etc., which are becoming more and more common in India just as in other large developing economies (Liu et al., 2016; Raghuram et al., 2011). Evidence from China suggests higher social risks of land acquisition and resettlement in mega projects, which necessitate significant public participation for project success (Liu et al., 2016). Very few authors have empirically validated the societal benefits (S3) (like poverty reduction) of construction projects (see for e.g., Wuttke and Vilks, 2014). With global evidences of the role of construction in poverty reduction in developing countries through capacity building of their large unskilled workforce (Anaman and Osei-Amponsah, 2007; Du Plessis, 2002), this area holds prominence for research in the Indian context. Furthermore, while it has been repeatedly argued that SC practices promote social equity, justice, intergenerational equity, and preservation of local culture and heritage (Adetunji et al., 2003; Berardi, 2013; Cheng et al., 2015; Hill and Bowen, 1997), any such empirical evidence is yet to be established in India. Therefore, the social issues S1, S7, S8 and S10 also present notable research gaps.

Under the environmental dimension, there are many articles under both the themes (Table 6). Yet, a few research gaps exist. For example, no specific article is available on sustainable land use (EN2), a critical area under SC (Kibert, 2016). Due to the extreme scarcity of finite land, especially since India holds the second largest population in the world, land reuse though brownfield development (Dair and Williams, 2006) may be a promising area for research. Similar gaps exist for EN4 and EN7. While the uptake of renewable sources for energy in India is promising (Wuttke and Vilks, 2014), research dealing with renewable sources of materials and energy in construction is still nascent with just one work by Mani and Reddy (2012) on EN1 in the sample.

The economic dimension reveals the most gaps in the literature. While there are few articles on the societal benefits, research on benefits for organizations is completely missing (Table 6). Under the first theme, the affordability of facilities (EC1) has been explored by a few authors in the housing sector, but the research is either conceptual or based on secondary data. So, there is scope for empirical studies with primary data in the housing sector and infrastructure projects. Only two papers dealing with the employment potential of construction (EC2) are available. With construction being the second largest employer in India, there is obviously large scope for investigating sector-specific employment benefits along with its role in poverty reduction (EC4). Studies on EC4 hold promise due to worldwide evidences that corporate social initiatives by construction firms have a profound positive effect on the community (Myers, 2005). The only study on this issue in India (Wuttke and Vilks, 2014) is restricted to large size, transnational corporations. Further, to motivate organizations towards SC, organizational benefits of SC (EC3 and EC8) need to be empirically validated in India. For example, using data from Brazil and Peru,

Carvalho and Rabechini (2017, p. 1120) have found 'significant and positive relation between project sustainability management and project success'.

Additionally, the SC research in India has shown more inclination towards (i) the final project *deliverable* (e.g., building's energy efficiency and waste) (48% articles) compared to the *processes* of managing and delivery of projects (e.g., feasibility study and procurement) (40% articles), and (ii) internal stakeholders (55% articles) compared to the external stakeholders (29% articles). Predominance of environment centric articles can be a reason for this bias as environmental sustainability assessment mostly relies on the performance of the final *deliverable* and not on *processes* of production of this deliverable (Berardi, 2013). Such an approach, however, often ignores incorporation of external stakeholders' concerns in project processes (Silvius, 2017). Accordingly, recent research on sustainable project management (see for e.g., Garies et al., 2013; Silvius et al., 2012; Silvius, 2017) emphasises equal importance on processes and the external stakeholders to ensure lifecycle sustainability of the *project*, its *deliverable* or *asset* and of the *product* produced by the asset. While processes like procurement, feasibility study, and external stakeholders like project affected community have been investigated from SC viewpoint in China and elsewhere (see for e.g., Liu et al., 2016; Li et al., 2018; Ma et al., 2017; Shen et al., 2010), a similar effort is required in India.

5.4. Future directions

Taking guidance from the recent studies from developing countries like China, Brazil, South Africa which are in similar stages of economic growth, we propose that the identified gaps, especially under the social and economic dimensions, be addressed through further SC research at three distinct levels — the temporary organization (project), the permanent organization, and individual actors or stakeholders.

At the project level, we recommend specific focus on large size or mega projects that consume a major share of natural resources, impact millions of people and are the key to nations' economic growth (Flyvbjerg, 2014). Increasing in numbers in India and receiving a large share of investment (~10%) of the gross fixed capital formation (Raghuram et al., 2011), mega projects are being regularly disrupted due to environmental clearance delays, public opposition and protests (Choudhury, 2014; Raghuram et al., 2011). Case studies from Chinese mega projects have confirmed higher social risks and need for explicit and continuous stakeholder management practices from the inception stage to build a sense of ownership among the project affected community and the wider society (Liu et al., 2016; Ma et al., 2017; Zhang et al., 2015). For example, an interesting case study by Cheng et al. (2015) has demonstrated SC practices in a large road project through use of local artefacts and close cooperation and collaboration among engineers, artists, government and local community. Considering the idiosyncrasies of such practices towards local language, culture and political scenario (Liu et al., 2016), mega projects present promising scope of investigating various social and economic sustainability gaps identified here in the Indian context.

At the organization level, the determinants of and barriers to environmentally and socially sustainable business practices have not been sufficiently explored in India. SC centric policies at the parent organization level promote similar practices at the project level (Yusof et al., 2016; Zuo et al., 2012). Some examples to this effect include, value focussed thinking in Brazil (Alencar et al., 2017), legislations in South Africa (Windapo and Goulding, 2015) and commitment of corporate leadership in China (Meng et al., 2015). Similar research is needed in the Indian context for formulation of policies and legislations by corporate and government that

drive SC by helping organizations to overcome the identified barriers.

In addition to the temporary and permanent organizations, research should also focus on various stakeholders whose role in promoting and implementing SC has been established worldwide but not in the Indian context. Specifically, the sustainability competence of project managers needs to be investigated as it directly impacts the project performance across TBL (Hwang and Ng, 2013). For example, in China, Zhang et al. (2013b) have identified 'working with others, stakeholder management, leading others, and social awareness' as the four key social competencies for project managers. There are many other stakeholders or actors whose role in facilitating SC in India is yet to be explored. They include: (i) government, by developing specific policies to promote SC (Hwang and Tan, 2012); (ii) urban planners, for sustainable urban development (Rydin et al., 2007); (iii) designers, for designing with safety focus (Dewlaney and Hallowell, 2012); (iv) local community, to tell the story of place and facilitate regeneration (Sertyesilisik, 2017); (v) suppliers, to support the main contractor through co-makership (Albino and Berardi, 2012) and, (vi) architects and engineers, to provide SC inputs in feasibility studies (Shen et al., 2010).

6. Conclusions

In India, one of the fastest growing large economies in the world, the construction output has been consistently rising with even higher estimates of future growth. The current practices of conceptualizing, planning, procuring and executing construction projects in India — marked by extremely high resource consumption and waste, ignorance of wider social benefits, public opposition and protests, and labour exploitation — have global ramifications as they impinge on the climate change mitigation efforts and achievement of the sustainable development goals. SC, therefore, is an imminent necessity in India and its implications surpass the geographical boundaries of this country. Yet, a lack of any comprehensive review on current state of SC in India provided motivation for this study. Accordingly, a SLR of research on SC in India has been carried out using CA. This review makes three distinct contributions.

First, it provides a snapshot of publication trends and focus of articles on one or more of the TBL dimensions and corresponding issues. The CA illustrates a narrow pursuit of SC in India, largely oriented towards the environmental dimension (on issues like emissions and pollution), the macro-industry level, and internal stakeholders. Consequent to being environment centric, the SC research has focussed more on elements connected to final project *deliverable* compared to the *processes* of managing and delivery of projects. While this may assist in meeting India's short term need for reducing construction related emissions, in the long run such an approach risks not being truly sustainable due to ignorance of external stakeholders' concerns in project processes and possible social risks (Silvius, 2017). Second, to facilitate the SLR, a deductive content analysis framework consisting of nine categories has been developed here. This framework has not only helped in answering the research questions for this study, but can also be used to conduct similar reviews rooted in other countries. Third, many research gaps have been identified here and directions for future research have been provided, largely based on recent research from other large developing economies. The suggestions for further research have been grouped along three separate themes — the permanent organization, the project and the actors or stakeholders — to ensure a holistic development of SC body of knowledge in India.

This review has implications for the industry practitioners as well as researchers. For the former, it provides a ready reference to the current state of SC in India; the latter may design further studies based on research gaps identified and the directions for future research proposed here. Stakeholders from other developing economies, expected to tread on a growth trajectory similar to India, may also find this review useful to benchmark the SC initiatives in their countries using the CA framework (Fig. 1).

While this review has attempted to provide a compressive coverage to the SC research literature in India, some limitations exist that need to be considered. Based on the methodological orientation adopted, the analysis relied on a deductive CA. Similarly, an inductive CA could have provided a distinctly different perspective. Further, as common to such SLRs (Sfakianaki, 2019) some pertinent articles may have been excluded in this review which is bound with explicit procedures. However, the authors believe — based on the selection of keywords and the academic databases — that the 62 articles analyzed here, provide a comprehensive and representative picture of SC research in India. Future research may build upon this review by adopting a wider keyword base and more in-depth, inductive analysis of the text contained in the articles. Also, as the body of knowledge on SC in India grows further, techniques like scientometric analysis could be used to develop rich networks of prominent authors, words, clusters, and geospatial patterns.

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